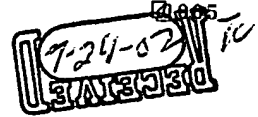


S/N: 09/312,797

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II. ELECTION/RESTRICTION

The Examiner indicated that the claims 4-26 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected embodiment, there being no allowable generic or linking claim. "Election was made without traverse in Paper No. 6".

Responsive to the Examiner, Applicant again reasserts that Applicant respectfully reserves the rights to file continuation application(s) to prosecution any of the withdrawn claims. Additionally, if and when a generic claim is ultimately deemed to be allowable in the present application, Applicant respectfully requests that any of the withdrawn claims that depend from such allowed generic claim be deemed allowable as well.

III. REJECTION OF CLAIMS 1-2 AND 27-30 UNDER 35 U.S.C. § 102

The Examiner again rejected in Paragraphs 5-6 of the Final Office Action claims 1-2, and 27-30 under 35 U.S.C. §102(e) as being anticipated by Lee et al. (US Patent 5,748,789, issued May 5, 1998). The rejection is respectfully traversed.

Specifically, the Examiner broadly alleged that Lee et al., in "Figures 13, 16, and 35 explicitly illustrate the well known concept of decomposing an input object mask 356 into a plurality of object mask layers (380, 386) and then encoding a next higher layer 386 of the plurality of object mask layers in accordance with information from a lower object mask layer 356." Applicant respectfully disagrees.

Lee et al. teaches a block skipping method. Specifically, Lee states that "the method of the invention reduces coding overhead and the number of bits needed to code objects in a sequence of video frames by using shape information to identify transparent transformation blocks around an object and then skipping encoding/decoding of these blocks". (See Lee et al., Column 3, lines 8-12)

However, Lee et al. completely fails to teach or suggest the novel concept of decomposing an input object mask into a plurality of object mask layers and then coding a next higher layer of said plurality of object mask layers in accordance with information from a lower object mask layer. Specifically, Applicant's independent claims 1, 27 and 29 positively recite:

1. A method for coding an input object mask, where said input object mask has a plurality of regions, said method comprising the steps of:
 - (a) assigning at least one symbol to each of the plurality of regions;
 - (b) coding said assigned symbols of the input object mask;

S/N: 09/312,797

- (c) decomposing said input object mask into a plurality of object mask layers of different spatial resolution;
- (d) coding a base object layer of said plurality of object mask layers; and
- (e) coding a next higher layer of said plurality of object mask layers in accordance with information from a lower object mask layer. (emphasis added)

27. A computer-readable medium having stored thereon a plurality of instructions, the plurality of instructions including instructions which, when executed by a processor, cause the processor to perform the steps of a method for coding an input object mask, where said input object mask has a plurality of regions, said method comprising the steps of:

- (a) assigning at least one symbol to each of the plurality of regions;
- (b) coding said assigned symbols of the input object mask;
- (c) decomposing said input object mask into a plurality of object mask layers of different spatial resolution;
- (d) coding a base object layer of said plurality of object mask layers; and
- (e) coding a next higher layer of said plurality of object mask layers in accordance with information from a lower object mask layer. (emphasis added)

29. An apparatus for coding an input object mask, where said input object mask has a plurality of regions, said apparatus comprising:
means for assigning at least one symbol to each of the plurality of regions;
a first means for coding said assigned symbols of the input object mask;
means for decomposing said input object mask into a plurality of object mask layers of different spatial resolution;
a second means for coding a base object layer of said plurality of object mask layers; and
a third means for coding a next higher layer of said plurality of object mask layers in accordance with information from a lower object mask layer.
(emphasis added)

Applicant's invention teaches a method and apparatus for increasing the efficiency of scalable shape coding by correlating the coding of the mask of the object between different scales. Specifically, in the present invention, a new generic spatially-scalable shape coding method is disclosed that is independent of the mask decomposition scheme. More specifically, with reference to Applicant's Fig. 10, a full-resolution image frame having at least one object is initially segmented into a plurality of blocks or regions. For the purpose of mask generation, each block is assigned a mode or symbol to indicate whether it is "opaque", "transparent" or "border". The modes for the entire mask are then encoded into the bitstream.

Next, the method decomposes the "top level" or full-resolution mask into a plurality of layers or mask levels of different spatial resolution using any shape or mask decomposition methods, e.g., any of the decomposition methods as discussed in Applicant's FIGs. 2-6. The lowest mask layer, i.e., "base mask layer", is then encoded into the bitstream.

S/N: 09/312,797

Next, the method hierarchically and contextually encodes mask layers that are above the base mask layer by using information from an immediate lower mask layer. Namely, each layer above the base mask layer (or "enhancement mask layer") is encoded using information that is derived from a mask layer that is immediately below the present mask layer of interest. In this manner, a generic spatially-scalable shape encoding method is provided that is capable of handling different shape or mask decomposition methods, while maximizing coding efficiency of the encoder.

In contrast, Lee et al. is completely devoid of any disclosure as to shape encoding in the context of decomposing an input object mask into a plurality of object mask layers and then coding a next higher layer of said plurality of object mask layers in accordance with information from a lower object mask layer. In fact, Lee et al. states that:

"In an object-based video encoder or decoder designed according to the invention, shape information is available independent of motion estimation and texture information. As such, the method of the invention can use the shape information to identify transparent transformation blocks and skip texture and possibly motion coding and decoding for these blocks. An encoder employing this method evaluates the shape of an object to determine whether a given block is transparent, i.e. covered by the object. If the block is transparent, the encoder can skip texture coding for inter and intra frame blocks. The encoder can also skip coding of motion estimation data, such as motion vectors or transformation coefficients for inter frame blocks. Similarly, the decoder can use decoded shape information to identify transparent blocks and skip texture or motion decoding for these blocks." (Emphasis added)(See Lee et al., Column 3, lines 13-28)

Thus, Lee et al. is addressing a completely different situation than Applicant's invention. Using shape information to skip blocks is **NOT** using shape invention to provide scalability. More importantly, Lee et al. is **completely silent** as to Applicant's particular method and apparatus for encoding an object mask.

First, the Examiner alleged that Lee's numerical references 380 and 386 correlate to Applicants' plurality of object mask layers. The Examiner is incorrect. Lee states that:

"Function block 378 indicates that the current transformation block (e.g., transformation block 374) is subdivided into, for example, four equal sub-blocks 380a-380d, affine transformations are determined for each of sub-blocks 380a-380d, and a future signal-to-noise ratio is determined with respect to the affine transformations.

Inquiry block 382 represents an inquiry as to whether the future signal-to-noise ratio is greater than the current signal-to-noise ratio by more than a user-selected threshold amount. This inquiry represents a determination that further subdivision of the current transformation block (e.g., transformation block 374)

S/N: 09/312,797

would improve the accuracy of the affine transformations by at least the threshold amount. Whenever the future signal-to-noise ratio is greater than the current signal-to-noise ratio by more than the threshold amount, inquiry block 382 proceeds to function block 384, and otherwise proceeds to function block 388.

Function block 384 indicates that sub-blocks 380a-380d are successively designated the current transformation block, and each are analyzed whether to be further subdivided. For purposes of illustration, sub-block 380a is designated the current transformation and processed according to function block 376 and further sub-divided into sub-blocks 386a-386d. Function block 388 indicates that a next successive transformation block 374' is identified and designated an initial or current transformation block.

" (See Lee, Column 22, line 54 to Column 23, line 15) (emphasis added).

The Examiner's attention is directed to the fact that Lee is changing the transformation block size. Changing the size of transformation blocks does **NOT** "decompose the input object mask into a plurality of object mask layers of different spatial resolution" as positively claimed by the Applicant. In other words, the input object mask itself is decomposed into a plurality of object mask layers of different spatial resolution, whereas Lee is teaching the use of different transformation block size, e.g., as use in performing motion estimation and compensation. An object mask layer of a different spatial resolution cannot be generated by simply selecting a different transformation block size. As noted by Lee, the selection of transformation block size is for improving the accuracy of the applying the affine transformation. Applicant's claims do not have such scope as to read on a disclosure that employs different transformation block size. It is respectfully submitted that Applicant's claims clearly recite Applicant's invention and would not read on the Lee reference.

Second, Lee et al. is completely silent as to Applicant's particular method and apparatus for encoding an object mask. There is simply no disclosure on this aspect.

Specifically, Examiner again reiterated broadly that Figures 13, 16, and 35 illustrate Applicant's entire invention. Respectfully, Applicant again requests that the Examiner specifically point out in the specification of the Lee reference that supports the Examiner's position. In fact, Applicant extracted the relevant portions of the Lee reference below pertaining to FIGs. 13, 16 and 35. Specifically, Lee states:

"FIG. 13 is a simplified representation of a display screen showing the image frame of FIG. 7B for purposes of illustrating the multi-dimensional transformation method of FIG. 12." (See Lee, Column 4, lines 44-47)

S/N: 09/312,797

"FIG. 16 is a simplified fragmentary representation of a display screen showing the image frame of FIG. 7B for purposes of illustrating the transformation block optimization method of FIG. 15." (See Lee, Column 4, lines 57-60)

"FIG. 35 illustrates how a frame of video can be divided into the objects in the frame." (See Lee, Column 5, lines 54-55)

"FIG. 12 is a functional block diagram of a transformation method 350 that includes generating a multi-dimensional transformation between objects in first and second successive image frames and quantizing the mapping for transmission or storage. The multi-dimensional transformation preferably is utilized in connection with function block 96 of FIG. 3. Transformation method 350 is described with reference to FIG. 7A and FIG. 13, the latter of which like FIG. 7B is a simplified representation of display screen 50 showing image frame 202b in which image feature 204 is rendered as object 204b." (See Lee, Column 18, lines 24-34)

"FIG. 15 is a functional block diagram of a transformation block optimization method 370 that automatically selects transformation block dimensions that provide a minimal error threshold. Optimization method 370 is described with reference to FIG. 16, which is a simplified representation of display screen 50 showing a portion of image frame 202b with object 204b." (See Lee, Column 22, lines 32-38)

As an example of object-based coding, FIG. 35 illustrates a frame of video in terms of the objects 1540-1544 that make up the frame. In this example, the frame 1538 is segmented into 3 objects: a person 1540, a spaceship 1542, and the background with landscape 1544a, tree 1544b, and sky 1544c. For simplicity we refer to the background generally using reference numeral 1544.

FIG. 35 shows the object representing a person 1540 in expanded form to show how this portion of the image is divided into transformation blocks. As part of the object definition process, the encoder computes a bounding rectangle 1546 for the object 1540. To code the object using transformation blocks, the encoder expands the bounding rectangle such that the rectangle is an integer multiple of transformation blocks (1548-1552) in both the vertical and horizontal direction. The transformation blocks 1548-1552 in this example are sometimes referred to as macroblocks. Each macroblock is further divided into sub-transformation blocks, referred to as "blocks."

During the coding process, the encoder codes the shape of the objects (e.g., 1540, 1542) separately from the objects' texture and motion data.

In FIG. 35 for example, the shape of the object representing the person 1540 is represented by a mask, and this mask is coded and decoded separately from the object's texture or motion data.

Since the object 1540 representing the person in video frame 1538 is separated from the other objects in the frame, the region inside the bounding box 1546 is likely to have some transparent macroblocks and blocks. The overhead and number of bits needed to encode the object's texture and motion data can be reduced by using shape to determine which transformation blocks (e.g., macroblocks) and sub-transformation blocks (e.g. blocks) are transparent (i.e. not covered by the object 1540). Once these transparent macroblocks and blocks are identified, the coder and decoder can skip coding for these macroblocks or blocks. Skipping of transparent transformation blocks applies when the entire transformation block is transparent. Skipping of transparent sub-transformation blocks applies to transformation blocks partially covered by an object. A "partially covered" macroblock may include one or more transparent blocks and one or more blocks covered by a portion of an object.

An example of a transparent macroblock is macroblock 1548, which lies entirely outside object 1540. An example of a partially covered macroblock is macroblock 1550, which includes transparent blocks 1554-1558 and partially covered block 1560 covered by a portion of the object 1562.

Before describing skipping of transparent transformation blocks, we describe

S/N: 09/312,797

object-based coding in more detail. This will provide a context for transparent block skipping, which is described in more detail below. (See Lee, Column 43, line 28 to Column 44, line 13)

It is respectfully requested that the Examiner point out with specificity as to how these extracted portions (or any other sections) from Lee et al.'s specification pertaining to FIGs. 13, 16 and 35 that would anticipate Applicant's invention. Contrary to the Examiner's position, it is Applicant's position that the above recitations from Lee et al. does not teach Applicant's invention.

Thus, the Applicant respectfully submits that Lee et al. would not anticipate Applicant's invention. As such, Applicant respectfully submits that independent claims 1, 27 and 29 are not anticipated by Lee et al. and, as such, fully satisfy the requirements of U.S.C. § 102 and are patentable thereunder.

Furthermore, dependent claims 2-3, 28, and 30 depend directly or indirectly from claims 1, 27 and 29 and recite additional features therefor. Since Lee et al. fails to teach or suggest claims 1, 27 and 29 of Applicant's invention, Applicant respectfully submits that dependent claims 2-3, 28, and 30 are not anticipated by the teachings of Lee et al. and, as such, fully satisfy the requirements of U.S.C. § 102 and are patentable thereunder.

Conclusion

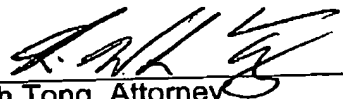
Thus, the Applicant submits that all of these claims now fully satisfy the requirements of 35 U.S.C. §102. Consequently, the Applicant believes that all these claims are presently in condition for allowance. Accordingly, both reconsideration of this application and its swift passage to issue are earnestly solicited.

If, however, the Examiner believes that there are any unresolved issues requiring the maintenance of the present adverse final action in any of the claims now pending in the application, it is requested that the Examiner telephone Mr. Kin-Wah Tong, Esq. at (732) 530-9404 so that appropriate arrangements can be made for resolving such issues as expeditiously as possible.

Respectfully submitted,

7/24/02

Moser, Patterson & Sheridan, LLP
Attorneys at Law
595 Shrewsbury Ave.
Shrewsbury, New Jersey 07702


Kin-Wah Tong, Attorney
Reg. No. 39,400
(732) 530-9404